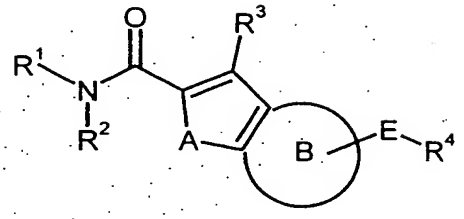
Patent Claims

1. Compounds of the formula



(I),

in which

R^1 is 1-azabicyclo[2.2.2]oct-3-yl, which is optionally substituted via the nitrogen atom by a radical selected from the group of C_1-C_4-alkyl, benzyl and oxy,

R^2 is hydrogen or C_1-C_6-alkyl,

R^3 is hydrogen, halogen or C_1-C_6-alkyl,

R^4 is hydrogen, halogen, cyano, amino, trifluoromethyl, trifluoromethoxy, C_1-C_6-alkyl, C_1-C_6-alkylcarbonyl, C_1-C_6-alkylamino, formyl, hydroxycarbonyl, C_1-C_6-alkoxy, C_1-C_6-alkoxycarbonyl, C_1-C_6-alkylthio, C_1-C_6-alkylcarbonylamino, C_1-C_6-alkylaminocarbonyl, C_1-C_4-alkylsulphonylamino, C_3-C_8-cycloalkylcarbonylamino, C_3-C_6-cycloalkylaminocarbonyl, pyrrolyl, C_1-C_6-alkylaminocarbonylamino, heterocyclylcarbonyl, heterocyclylcarbonylamino, heteroarylcarbonylamino, hydroxyl, phenyl or heterocyclyl,

where C_1-C_6-alkyl may optionally be substituted by hydroxyl, cyano, amino, C_1-C_6-alkylaminocarbonylamino, C_1-C_6-alkylaminocarboxyl, heterocyclyl or aryl,

C_1-C_6-alkylaminocarbonyl may optionally be substituted by C_1-C_6-alkoxy or C_1-C_6-alkylamino,

C_1-C_6-alkylcarbonylamino may optionally be substituted by C_1-C_6-alkoxy, and heterocyclyl may optionally be substituted by oxo,

A is oxygen or sulphur,

the ring B is benzo or pyrido, each of which are optionally substituted by radicals from the series halogen, cyano, formyl, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkyl and C_1-C_6-alkoxy,

and

E is C≡C, arylene and heteroarylene, where arylene and heteroarylene may be substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkoxy and C_1-C_6-alkyl,

and the solvates, salts or solvates of the salts of these compounds.

2. Compounds according to Claim 1, of the formula (I), in which

R^1 is 1-azabicyclo[2.2.2]oct-3-yl,

R^2 is hydrogen or C_1-C_4-alkyl,

R^3 is hydrogen, fluorine, chlorine, bromine or C_1-C_4-alkyl,

R^4 is hydrogen, fluorine, chlorine, bromine, cyano, amino, trifluoromethyl, trifluoromethoxy, C_1-C_4-alkyl, C_1-C_4-alkylcarbonyl, C_1-C_4-alkylamino, formyl, hydroxycarbonyl, C_1-C_4-alkoxy, C_1-C_4-alkoxycarbonyl, C_1-C_4-alkylthio, C_1-C_4-alkylcarbonylamino, C_1-C_4-alkylaminocarbonyl, C_1-C_4-alkylsulphonylamino, C_3-C_6-cycloalkylcarbonylamino, C_3-C_6-cycloalkylaminocarbonyl, pyrrolyl, C_1-C_4-alkylaminocarbonylamino, heterocyclylcarbonyl, heterocyclylcarbonylamino, heteroarylcarbonylamino, hydroxyl, phenyl or heterocyclyl,

where C_1-C_4-alkyl may optionally be substituted by hydroxyl, cyano, amino, C_1-C_4-alkylaminocarbonylamino, C_1-C_4-alkylaminocarboxyl, heterocyclyl or aryl,
C_1-C_4-alkylaminocarbonyl may optionally be substituted by C_1-C_4-alkoxy or C_1-C_4-alkylamino,
C_1-C_4-alkylcarbonylamino may optionally be substituted by C_1-C_4-alkoxy, and heterocyclyl may optionally be substituted by oxo,

A is oxygen or sulphur,

the ring B is benzo or pyrido, each of which are optionally substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy and C_1-C_4-alkyl,

and

E is C≡C, arylene and heteroarylene, where arylene and heteroarylene may be substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_4-alkoxy and C_1-C_4-alkyl,

and the solvates, salts or solvates of the salts of these compounds.

3. Compounds according to Claims 1 and 2, of the formula (I), in which

R^1 is 1-azabicyclo[2.2.2]oct-3-yl,

R^2 and R^3 are hydrogen,

R^4 is hydrogen, fluorine, chlorine, bromine, cyano, amino, trifluoromethyl, trifluoromethoxy, C_1-C_4-alkyl, C_1-C_4-alkylcarbonyl, C_1-C_4-alkylamino, formyl, hydroxycarbonyl, C_1-C_4-alkoxy, C_1-C_4-alkoxycarbonyl, C_1-C_6-alkylthio, C_1-C_4-alkylcarbonylamino, C_1-C_4-alkylaminocarbonyl, C_1-C_4-alkylsulphonylamino, C_3-C_6-cycloalkylcarbonylamino, C_3-C_6-cycloalkylaminocarbonyl, pyrrolyl, C_1-C_4-alkylaminocarbonylamino, heterocyclylcarbonyl, heterocyclylcarbonylamino, heteroarylcarbonylamino, hydroxyl, phenyl or heterocyclyl,

where C_1-C_4-alkyl may optionally be substituted by hydroxyl, cyano, amino, C_1-C_4-alkylaminocarbonylamino, C_1-C_4-alkylaminocarboxyl, heterocyclyl or aryl,

C_1-C_4-alkylaminocarbonyl may optionally be substituted by C_1-C_4-alkoxy or C_1-C_4-alkylamino,

C_1-C_4-alkylcarbonylamino may optionally be substituted by C_1-C_4-alkoxy, and heterocyclyl may optionally be substituted by oxo,

A is oxygen,

the ring B is benzo or pyrido, each of which are optionally substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy and C_1-C_4-alkyl,

and

E is C≡C, arylene and heteroarylene, where arylene and heteroarylene may be substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_4-alkoxy and C_1-C_4-alkyl,

and the solvates, salts or solvates of the salts of these compounds.

4. Compounds according to Claims 1 to 3, of the formula (I), in which

R^1 is 1-azabicyclo[2.2.2]oct-3-yl,

R^2 is hydrogen or C_1-C_6-alkyl,

R^3 is hydrogen, halogen or C_1-C_6-alkyl,

R^4 is hydrogen, halogen, cyano, amino, trifluoromethyl, trifluoromethoxy, C_1-C_6-alkyl, C_1-C_6-alkylcarbonyl, C_1-C_6-alkylamino, formyl, hydroxycarbonyl, C_1-C_6-alkoxy, C_1-C_6-alkoxycarbonyl, C_1-C_6-

alkylthio, C_1-C_6-alkylcarbonylamino, C_1-C_4-alkylsulphonylamino, C_3-C_8-cycloalkylcarbonylamino, pyrrolyl, C_1-C_6-alkylaminocarbonylamino, heterocyclylcarbonyl, phenyl or heterocyclyl,

where C_1-C_6-alkyl may optionally be substituted by hydroxyl, amino, C_1-C_6-alkylaminocarbonylamino, C_1-C_6-alkylaminocarboxyl, heterocyclyl or aryl,
C_1-C_6-alkylcarbonylamino may optionally be substituted by C_1-C_6-alkoxy, and
heterocyclyl may optionally be substituted by oxo,

A is oxygen or sulphur,

the ring B is benzo or pyrido, each of which are optionally substituted by radicals from the series halogen, cyano, formyl, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkyl and C_1-C_6-alkoxy,

and

E is C≡C, arylene and heteroarylene, where arylene and heteroarylene are optionally substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkoxy and C_1-C_6-alkyl,

and the solvates, salts or solvates of the salts of these compounds.

5. Compounds of the formula (I) according to Claims 1 to 4, in which

R^1 is 1-azabicyclo[2.2.2]oct-3-yl,

R^2 is hydrogen or C_1-C_6-alkyl,

R^3 is hydrogen, halogen or C_1-C_6-alkyl,

R^4 is hydrogen, halogen, cyano, trifluoromethyl, trifluoromethoxy, C_1-C_6-alkyl, C_1-C_6-alkoxy or heterocyclyl, where alkyl is optionally substituted by a hydroxyl radical,

A is oxygen or sulphur,

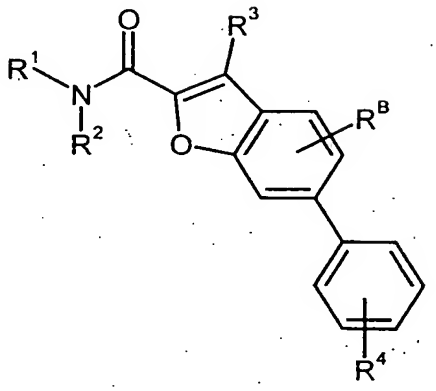
the ring B is benzo or pyrido, each of which are optionally substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkyl and C_1-C_6-alkoxy,

and

E is C≡C, arylene or heteroarylene, where arylene and heteroarylene are optionally substituted by radicals from the series halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkyl and C_1-C_6-alkoxy,

and the solvates, salts or solvates of the salts of these compounds.

6. Compounds according to Claims 1 to 5, of the formula



(Ia),

in which

R^1 is (3*R*)-1-azabicyclo[2.2.2]oct-3-yl,

R^2 and R^3 are, independently of one another, hydrogen or methyl,

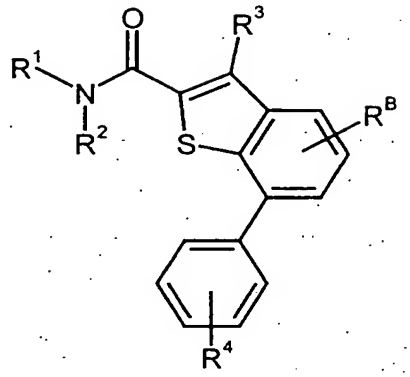
R^4 is hydrogen, halogen, cyano, trifluoromethyl, trifluoromethoxy, C_1-C_6-alkyl, C_1-C_6-alkoxy or heterocyclyl, where alkyl is optionally substituted by a hydroxyl radical,

and

R^B is hydrogen, halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkyl or C_1-C_6-alkoxy,

and the solvates, salts or solvates of the salts of these compounds.

7. Compounds according to Claims 1 to 6, of the formula



(Ib),

in which

R^1 is (3*R*)-1-azabicyclo[2.2.2]oct-3-yl,

R^2 and R^3 are, independently of one another, hydrogen or methyl,

R^4 is hydrogen, halogen, cyano, trifluoromethyl, trifluoromethoxy, C_1-C_6-alkyl, C_1-C_6-alkoxy or heterocyclyl, where alkyl is optionally substituted by a hydroxyl radical, and

R^B is hydrogen, halogen, cyano, trifluoromethyl, trifluoromethoxy, nitro, amino, C_1-C_6-alkyl and C_1-C_6-alkoxy,

and the solvates, salts or solvates of the salts of these compounds.

8. Compounds according to Claims 1 to 7, where

R^1 is (3*R*)-1-azabicyclo[2.2.2]oct-3-yl,

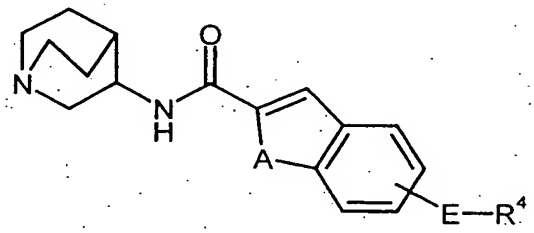
R^2 and R^3 are hydrogen,

R^4 is hydrogen, fluorine, chlorine, bromine, trifluoromethoxy, hydroxymethyl, methoxy or 6-membered heterocyclyl and

R^B is hydrogen, halogen, cyano, trifluoromethyl, trifluoromethoxy or C_1-C_4-alkyl,

and the solvates, salts or solvates of the salts of these compounds.

9. Compounds according to Claims 1 to 8, of the formula

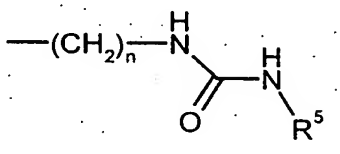


(Ic),

in which

E is phenylene,

R^4 is C_1-C_6-alkoxy, aminomethyl, hydroxycarbonyl, C_3-C_8-cycloalkyl-carbonylamino, a group of the formula



,

where

R^5 is C_1-C_6-alkyl,

n is zero, 1, 2, 3 or 4,

or

5- to 6-membered heterocyclyl which is optionally substituted by oxo,

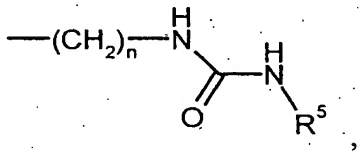
A is sulphur or oxygen,

and the solvates, salts or solvates of the salts thereof.

10. Compounds according to Claims 1 to 9, of the formula (Ic), in which

E is phenylene,

R^4 is C_1-C_4-alkoxy, aminomethyl, hydroxycarbonyl, C_3-C_6-cycloalkyl-carbonylamino, a group of the formula



where

R^5 is C_1-C_4-alkyl,

n is zero, 1 or 2,

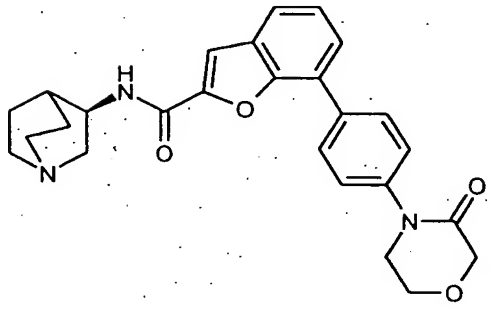
or

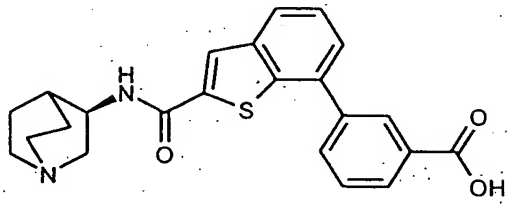
5- to 6-membered heterocyclyl which is optionally substituted by oxo,

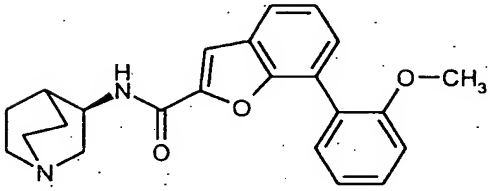
A is sulphur or oxygen,

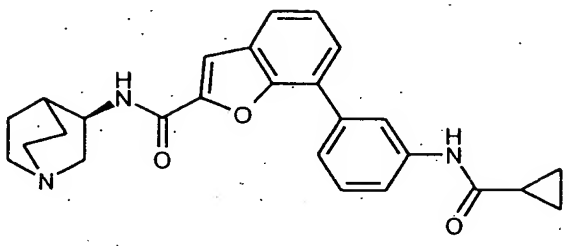
and the solvates, salts or solvates of the salts thereof.

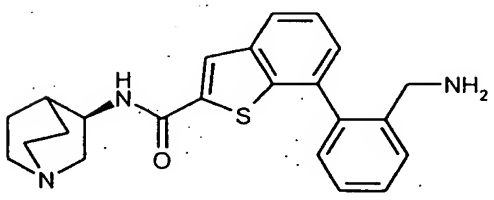
11. Compounds according to Claims 1 to 10, of the following formulae

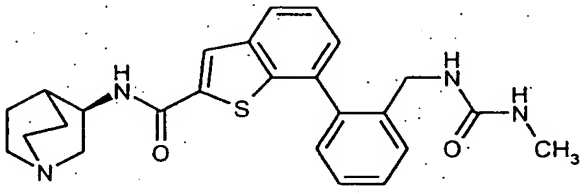


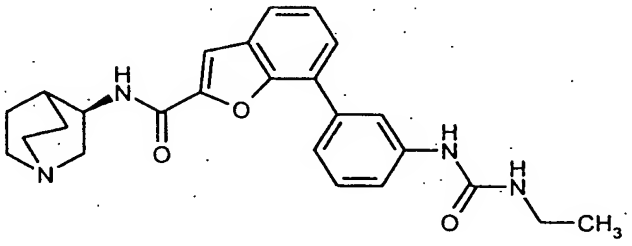












and the solvates, salts or solvates of the salts of these compounds.

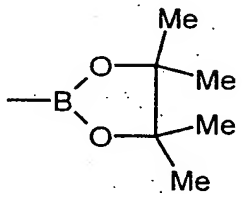
12. Process for the preparation of the compounds of the formula (I), in which compounds of the formula

$$X^1\text{-}E\text{-}R^4 \quad (II),$$

in which

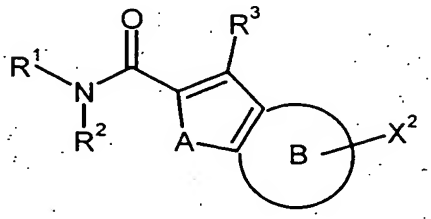
R^4 has the meanings indicated in Claim 1, and

X^1 is $-B(OH)_2$ or



in the case where E is arylene or heteroarylene, and is hydrogen in the case where E is -C≡C-,

are reacted with a compound of the formula



(III),

in which

R^1, R^2, R^3, A and the ring B have the meanings indicated in Claim 1, and

X^2 is triflate or halogen, preferably chlorine, bromine or iodine,

and where appropriate

[A] the resulting compounds (I) are alkylated on the quinuclidine nitrogen atom with appropriate alkylating reagents, or

[B] the resulting compounds (I) are oxidized on the quinuclidine nitrogen atom with suitable oxidizing agents,

and the resulting compounds (I) are converted into their solvates, salts or solvates of the salts where appropriate with the appropriate (i) solvents and/or (ii) bases or acids.

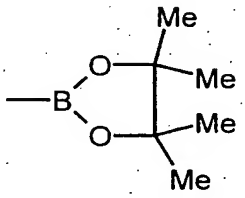
13. Process for the preparation of the compounds of the invention, in which compounds of the formula

$$X^1\text{-}E\text{-}R^4 \quad (II),$$

in which

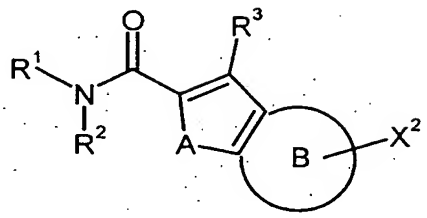
R^4 has the meanings indicated in Claim 1, and

X^1 is $-B(OH)_2$ or



in the case where E is arylene or heteroarylene, and is hydrogen in the case where E is -C≡C-,

are reacted with a compound of the formula



(III),

in which

R^1, R^2, R^3, A and the ring B have the meanings indicated in Claim 1, and

X^2 is triflate or halogen, preferably chlorine, bromine or iodine,

and the resulting compounds (I) are converted into their solvates, salts or solvates of the salts where appropriate with the appropriate (i) solvents and/or (ii) bases or acids.

14. Compounds according to any of Claims 1 to 11 for the treatment and/or prophylaxis of diseases.

15. Medicament comprising at least one compound according to any of Claims 1 to 11 and at least one pharmaceutically acceptable, essentially nontoxic carrier or excipient.

16. Use of compounds according to any of Claims 1 to 11 for producing a composition for improving perception, concentration, learning and/or memory.

17. Use of compounds according to any of Claims 1 to 11 for producing a medicament for the treatment and/or prophylaxis of impairments of perception, concentration, learning and/or memory.

18. Medicament according to Claim 15 for the treatment and/or prophylaxis of impairments of perception, concentration, learning and/or memory.